Tamworth, New Hampshire

NH Route 113 Bridge over the Bearcamp River

ALTERNATIVES PRESENTATION

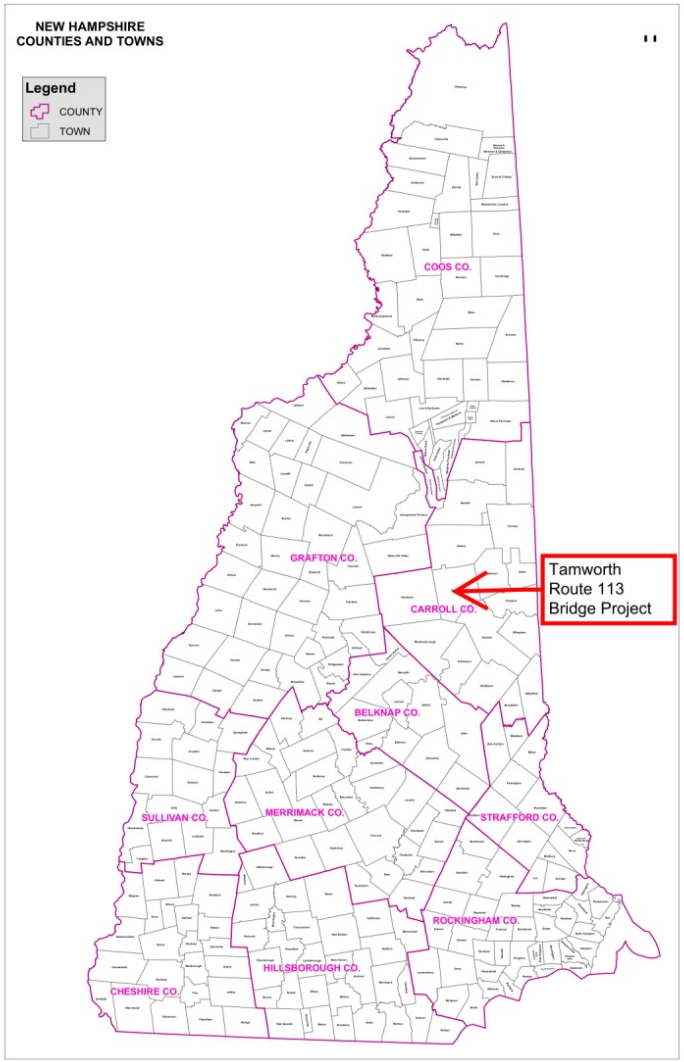
April 22, 2014

New Hampshire DOT
Department of Transportation

DuBois & King inc.

Overview

- Replace or rehabilitate existing bridge
- Bridge is on State's Redlist:
  - Deck and substructure are rated "4–Poor" – therefore, identified as "structurally deficient"
- Scour critical bridge - bridge is susceptible to damage or instability from scour
- NH Bridge Priority #79



Overview (continued)

- **Existing bridge constructed in 1955 (59 years old)**
- **Composed of 3 simple spans:**
  - 24′–6″ concrete slab approach spans
  - 71′–6″ main center span (composed of 5 steel girders and concrete deck)
  - Overall length = 123′–9″
- **28′–0″ curb-to-curb (34′–6″ out-to-out)**
  - 2′–6″ safety curb on each side (no approach sidewalks)

NH Route 113 bridge, looking upstream

Existing Structure

Northern pier

Existing Structure

Southern pier

Existing Structure

Looking south towards intersection with Whittier Road

Existing Structure

Historic and Natural Resource Findings

- Recently determined by the NH Division of Historic Resources that neither the bridge nor the former Amos Webster houses (13 and 20 Bryant Road) are eligible for the National Register of Historic Places/Structures
- Also determined that there is no potentially eligible historic district in the project area
- There are no wetlands within the project area, except for the river
- A field investigation of archaeological resources will be conducted this spring

Public Meeting 9/26/13

- **Design Team discussed alternatives being considered:**
  - Rehabilitation
  - Replacement on existing alignment
  - Replacement on shifted (downstream) alignment
- **Design Team also discussed:**
  - Closing the bridge vs. maintaining traffic during construction
  - Phasing construction to keep the bridge open throughout construction
  - Steel and precast concrete bridge options
  - Historical and natural resource reviews

Public Meeting Outcome

- **The Team took the public input from the last meeting and developed the alternatives being shown:**

  1. Comprehensive rehabilitation

  2. Complete replacement on existing alignment using Accelerated Bridge Construction (ABC) techniques

  3. Complete replacement using phased construction on a slightly shifted (downstream) alignment

Bridge Components

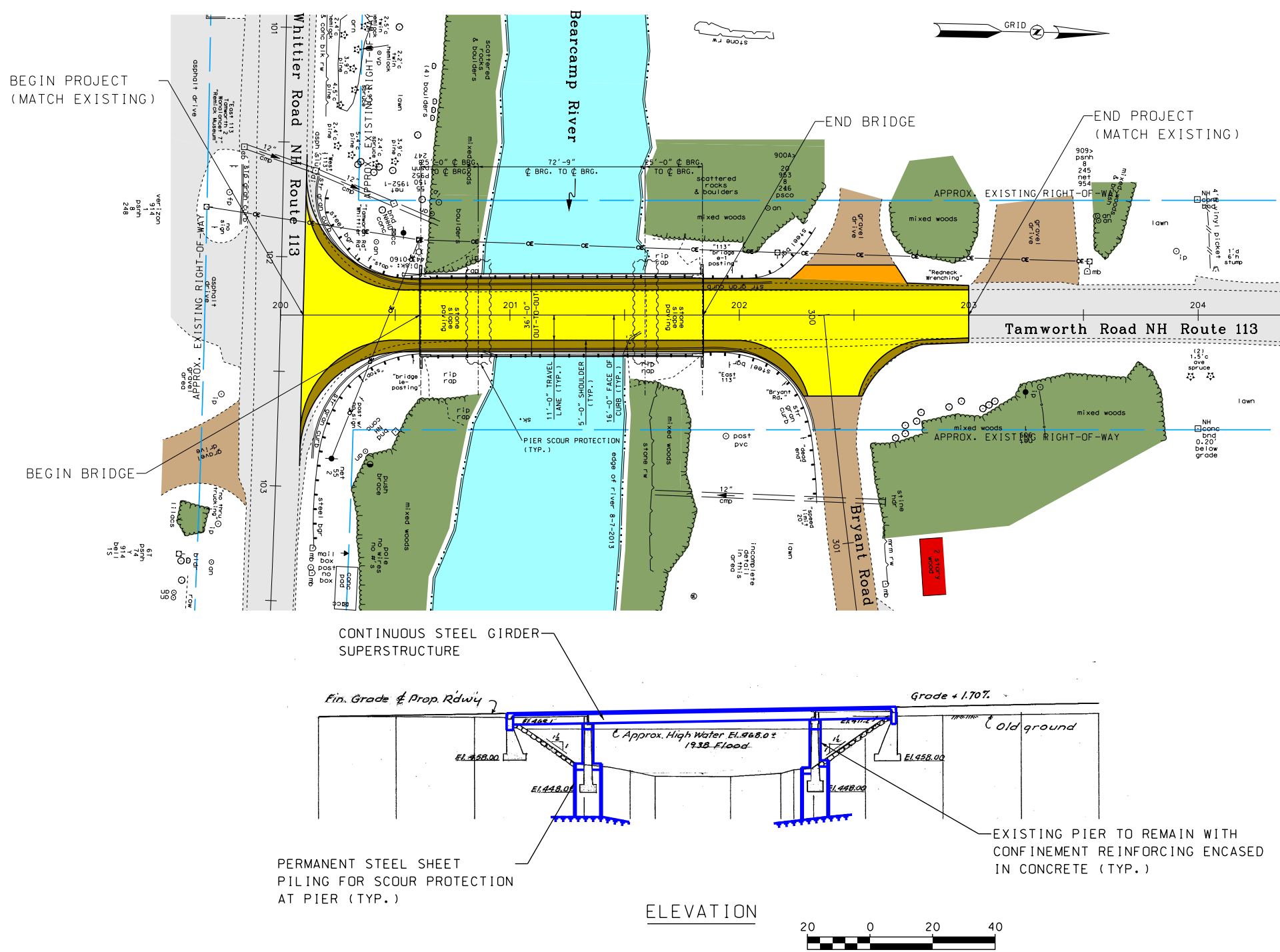
- Replace deck, slabs, beams, and railing
- Replace bearings
- Rehabilitate piers
- Install sheeting around piers for scour protection
- New deck would be wider than existing (11’ travel lanes with 5’ shoulders to curb line)

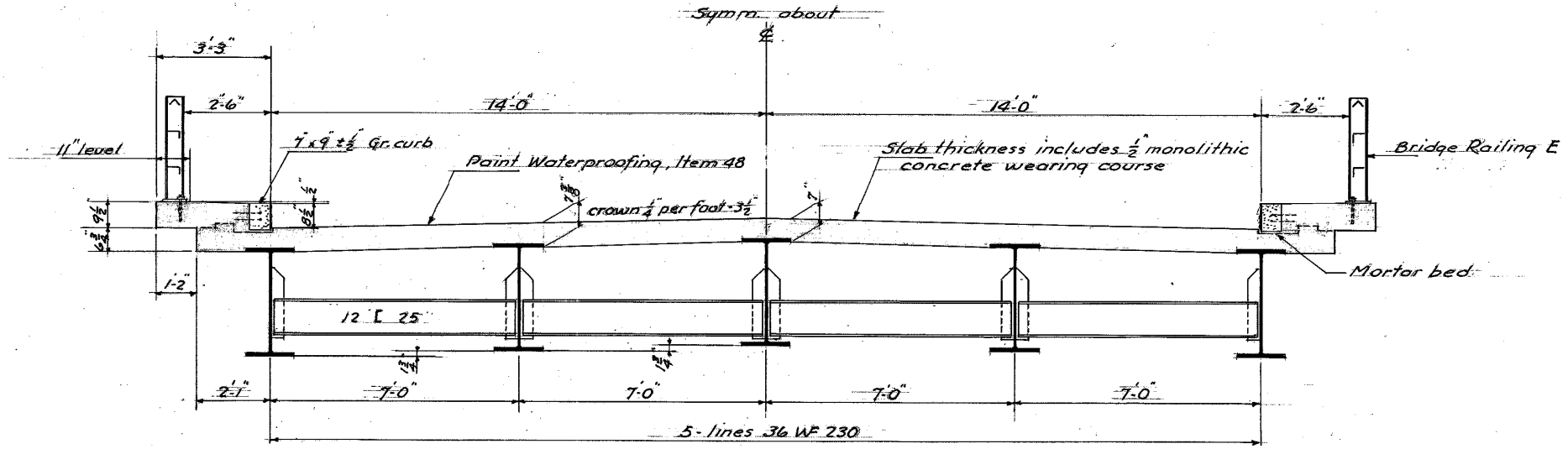
ALTERNATIVE 1 COMPREHENSIVE REHABILITATION

Impacts/Results

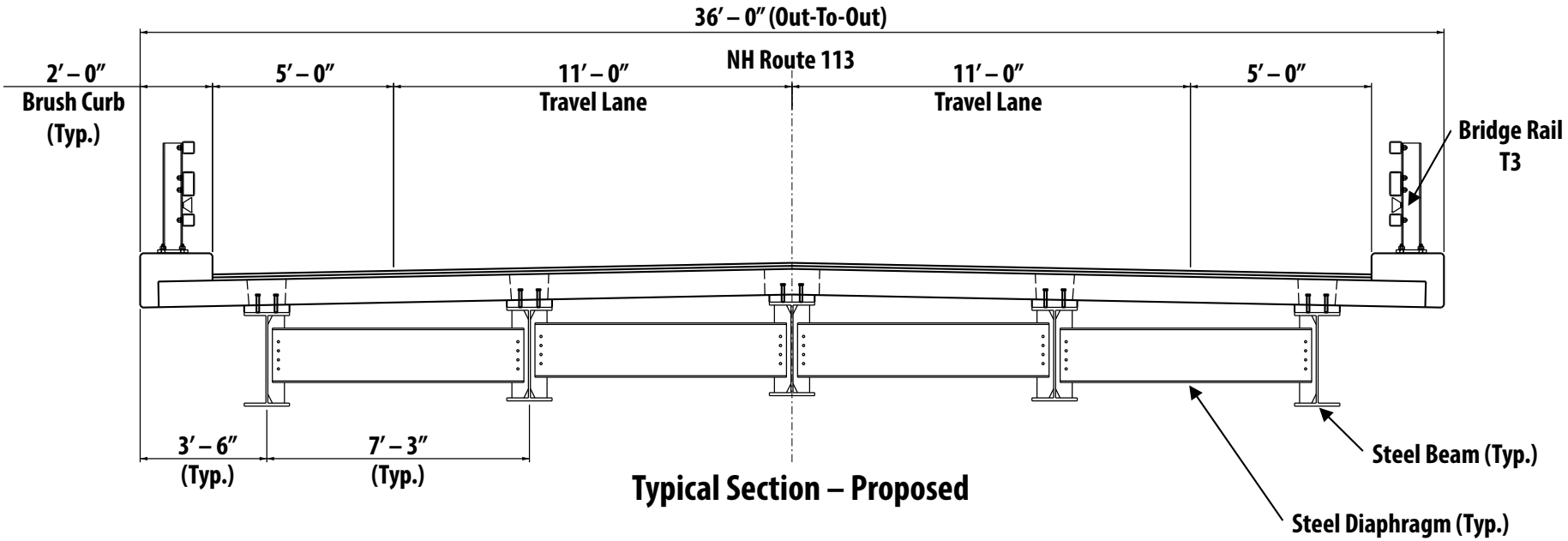
- Close bridge/detour traffic onto other State highways
- Phased construction not practical due to narrowness of existing deck and substructure
- Approximate 10 week construction period
- Service life extended +/- 40 years
- Estimated construction cost ~ $1,760,000

ALTERNATIVE 1 COMPREHENSIVE REHABILITATION


BEGIN PROJECT
(MATCH EXISTING)
BEGIN BRIDGE
END BRIDGE
END PROJECT
(MATCH EXISTING)
Whittier Road NH Route 113
Tamworth Road NH Route 113
Bryant Road
Bearcamp River
APPROX. EXISTING RIGHT-OF-WAY
PIER SCOUR PROTECTION
(TYP.)
CONTINUOUS STEEL GIRDER
SUPERSTRUCTURE
Fin. Grade & Prop. Rdwy
Grade + 1.70%
℄ Approx. High Water El. 468.0 ± 1938 Flood
℄ Old ground
El. 458.00
El. 448.00
PERMANENT STEEL SHEET
PILING FOR SCOUR PROTECTION
AT PIER (TYP.)
EXISTING PIER TO REMAIN WITH
CONFINEMENT REINFORCING ENCASED
IN CONCRETE (TYP.)
ELEVATION
20 0 20 40



Typical Section – Existing (Span 2)



Typical Section – Proposed

Summary

- **Advantages**
  - Lower initial construction cost (compared to Alts. 2 and 3)
  - Existing alignment maintained
  - No ROW impacts
- **Disadvantages**
  - Existing substructures remain (with piers in river)
  - Shorter service life and/or increased maintenance of remaining components
  - Long-term bridge closure with impacts to travelling public/emergency services (extensive detour and communications plan for travelling public and significant emergency service accommodations necessary)

ALTERNATIVE 1 COMPREHENSIVE REHABILITATION

Bridge Components

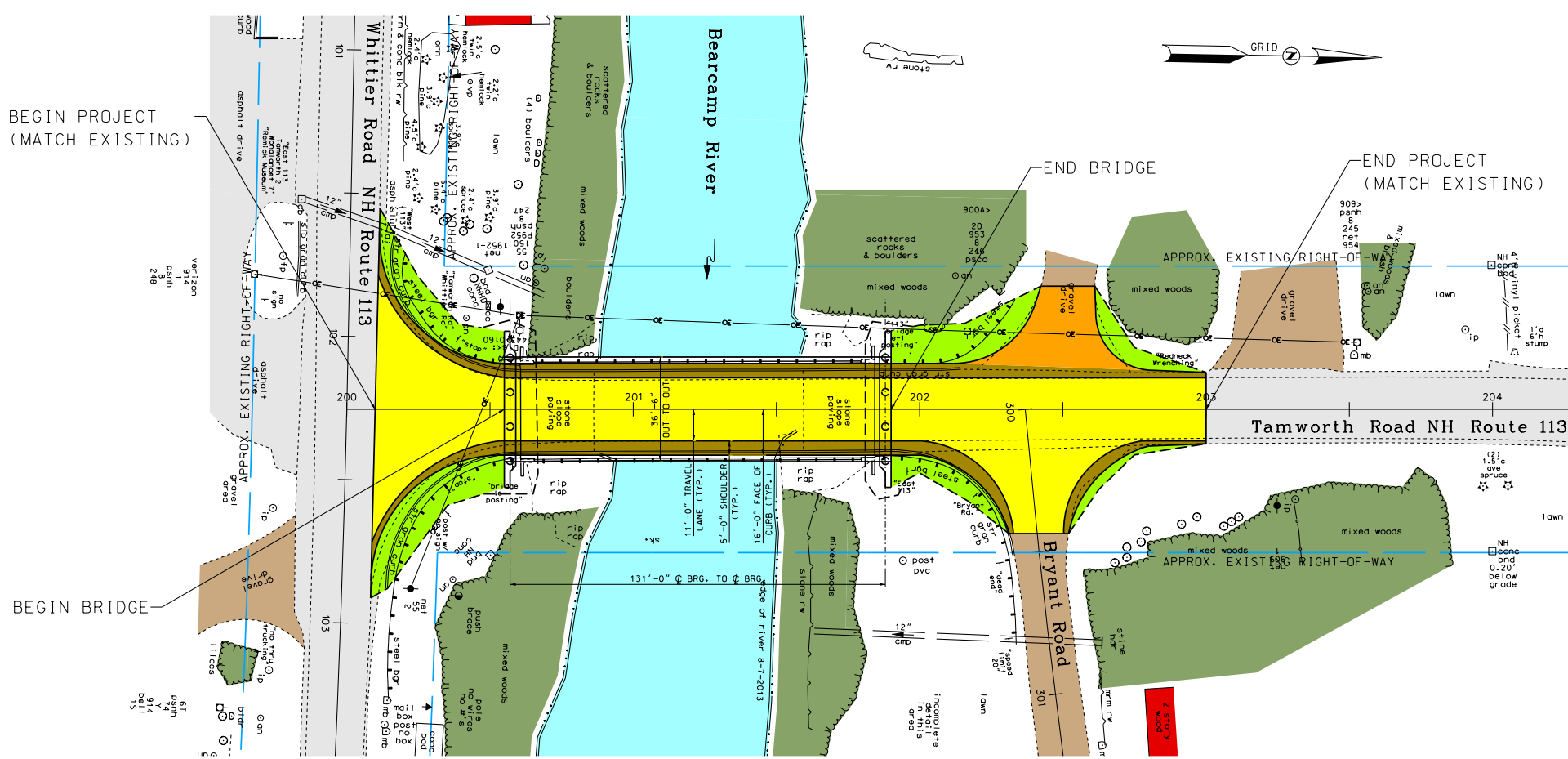
- Replace with single span bridge approximately 131’ long
- Remove piers
- 11’ travel lanes with 5’ shoulders (to curb line)
- Precast concrete beams (steel is not practical at this length because required beam depth will force either a raise in road profile or reduction in the hydraulic opening)

ALTERNATIVE 2 COMPLETE REPLACEMENT USING ABC

Impacts/Results

- New supports partially constructed behind existing, while maintaining one-lane alternating traffic
- Close bridge while existing structure is removed, supports are completed, and deck is installed
- Traffic detoured onto other State highways for approximately 21 days
- Service life of at least 75 years
- Estimated construction cost ~ $1,840,000

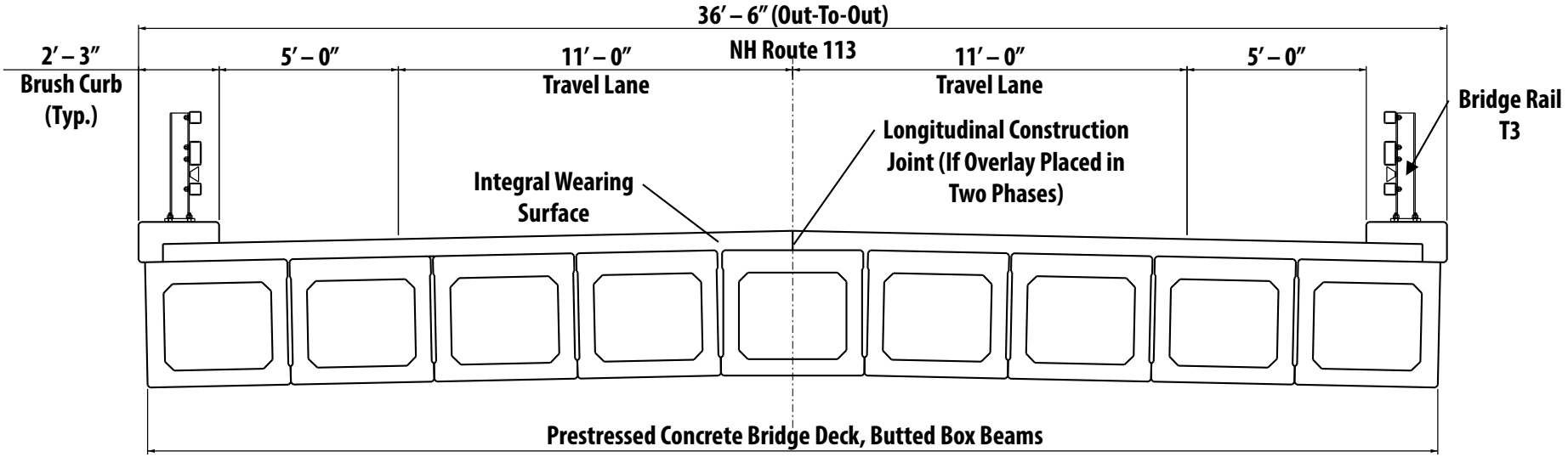
ALTERNATIVE 2 COMPLETE REPLACEMENT USING ABC



ELEVATION

20 0 20 40

SCALE IN FEET



Typical Section – Proposed

Summary

- **Advantages**
  - Single span bridge (no pier construction, fewer bearings required, improved hydraulics, less scour/seismic susceptibility, reduced environmental impacts)
  - Lower construction cost (compared to Alt. 3)
  - Existing alignment maintained
  - Longer service life/decreased maintenance (compared to Alt. 1), resulting in lower long-term costs
  - No ROW impacts
- **Disadvantages**
  - Inconveniences to traffic due to short-term bridge closure
  - Detour and communications plan needed
  - Accommodations for emergency services during closure will need to be resolved prior to advertising

ALTERNATIVE 2 COMPLETE REPLACEMENT USING ABC

Bridge Components

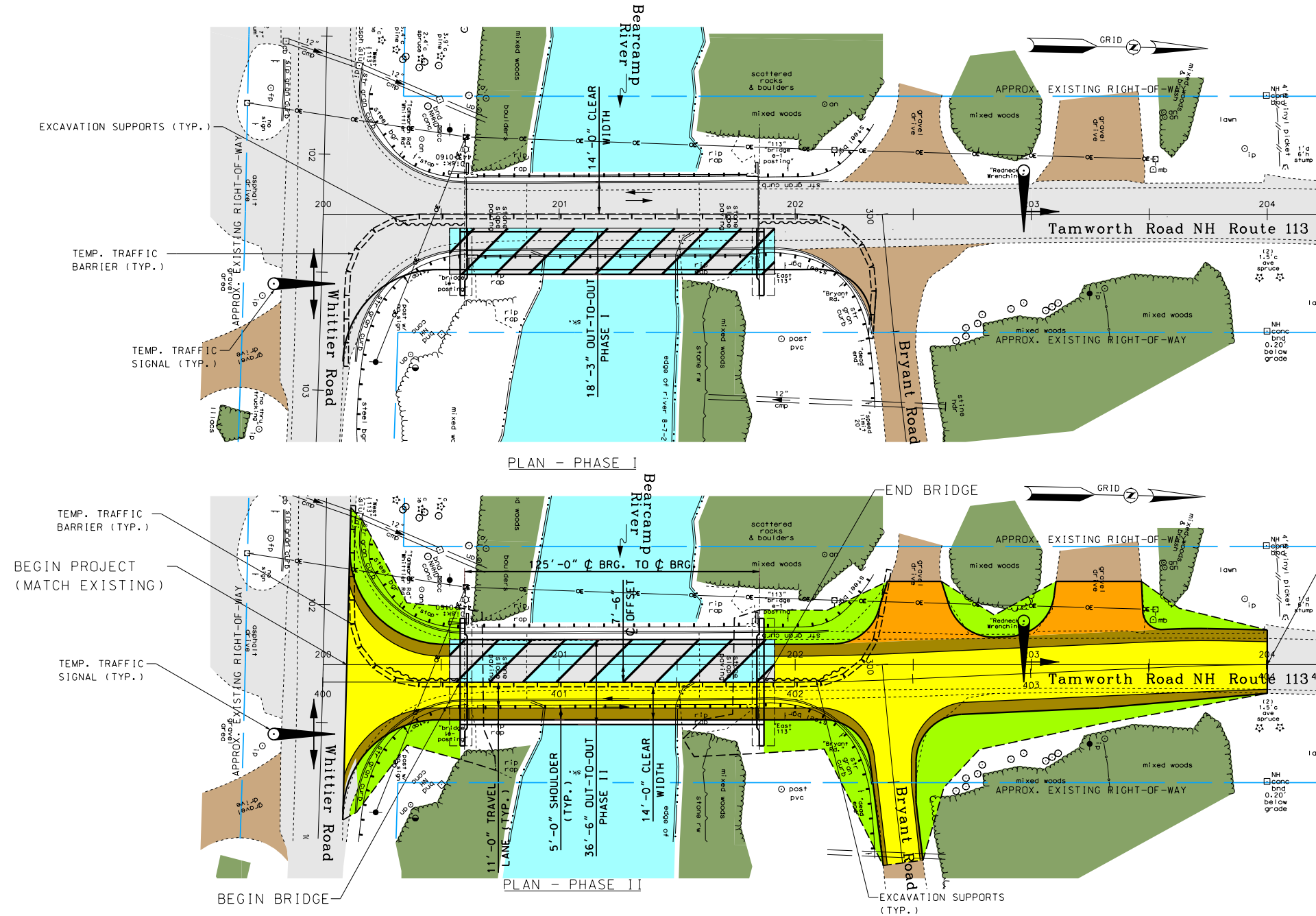
- Replace with single span bridge approximately 125’ long
- Remove piers
- 11’ travel lanes with 5’ shoulders (to curb line)
- Precast concrete beams (steel is not practical at this length because required beam depth will force either a raise in road profile or reduction in the hydraulic opening)
- Shifted approximately 7.5’ downstream (east)

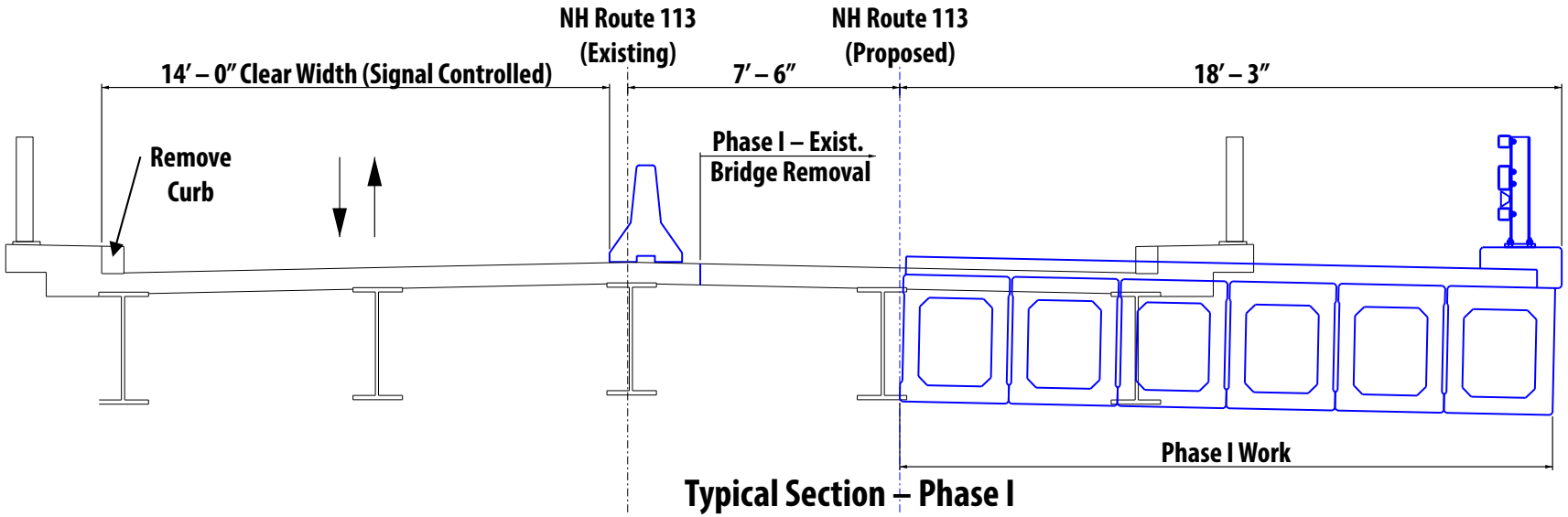
ALTERNATIVE 3 COMPLETE REPLACEMENT USING PHASED CONSTRUCTION

Impacts/Results

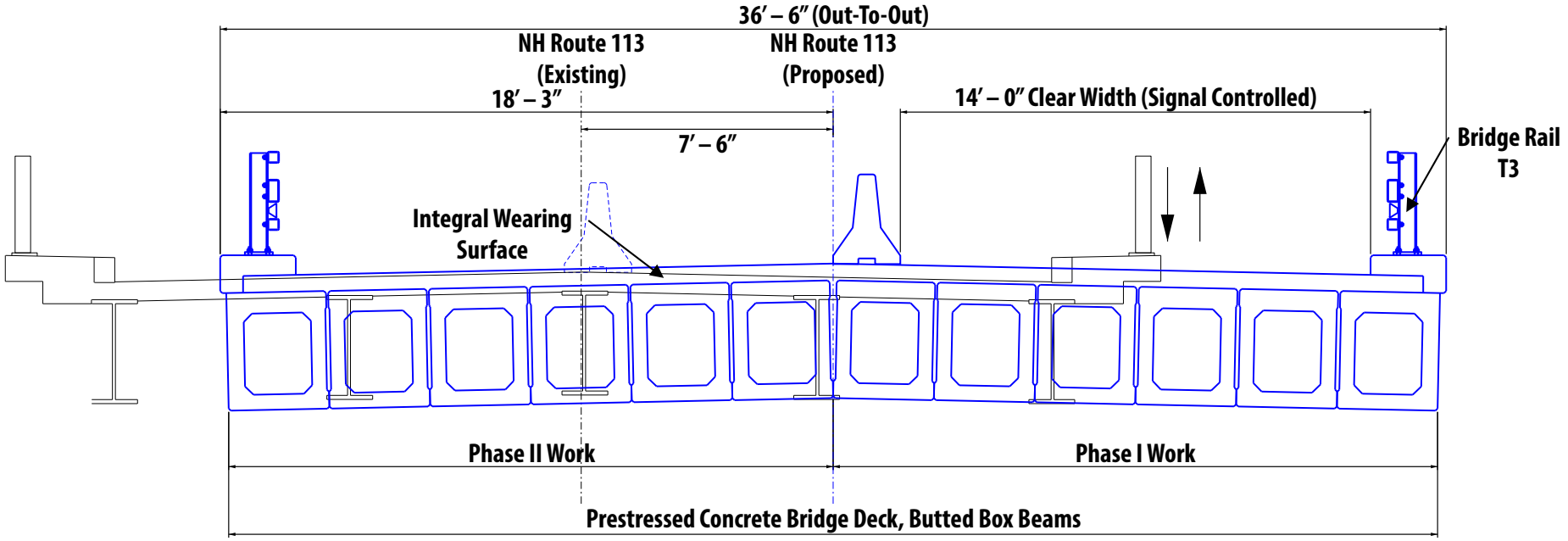
- One-lane alternating traffic on upstream side, while downstream half is replaced
- Once downstream half is replaced, one-lane alternating traffic on the new portion, while upstream half is demolished and replaced
- One-lane, alternating traffic for approximately 8 months
- Service life of at least 75 years
- Estimated construction cost ~ $2,300,000

ALTERNATIVE 3 COMPLETE REPLACEMENT USING PHASED CONSTRUCTION


EXCAVATION SUPPORTS (TYP.)
TEMP. TRAFFIC BARRIER (TYP.)
TEMP. TRAFFIC SIGNAL (TYP.)
Bearcamp River
14'-0" CLEAR WIDTH
18'-3" OUT-TO-OUT PHASE I
Whittier Road
Bryant Road
Tamworth Road NH Route 113
APPROX. EXISTING RIGHT-OF-WAY
GRID
PLAN - PHASE I
END BRIDGE
BEGIN PROJECT (MATCH EXISTING)
125'-0" ℄ BRG. TO ℄ BRG.
7'-6" OFFSET
5'-0" SHOULDER (TYP.)
36'-6" OUT-TO-OUT PHASE II
11'-0" TRAVEL LANE (TYP.)
BEGIN BRIDGE
EXCAVATION SUPPORTS (TYP.)
PLAN - PHASE II
20 0 20 40
SCALE IN FEET



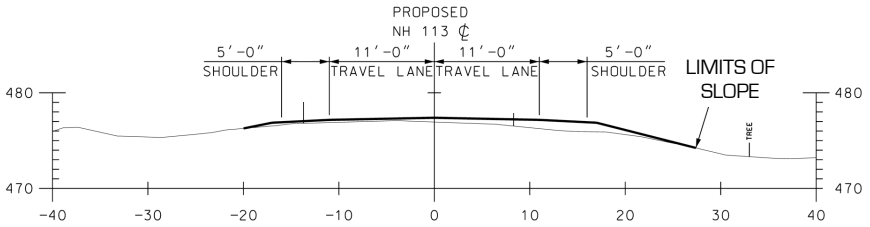
Typical Section – Phase I



Typical Section – Phase II

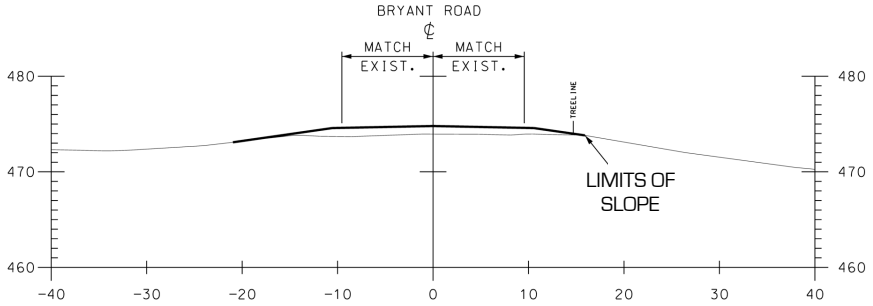
ALTERNATIVE 3
CRITICAL CROSS SECTIONS

PROPOSED NH 113

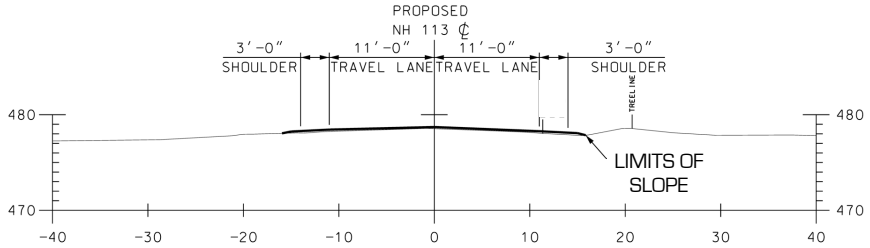


403+00

BRYANT ROAD



300+60



403+75

Summary

- **Advantages**
  - Single span bridge (no pier construction, fewer bearings required, improved hydraulics, less scour/seismic susceptibility, reduced environmental impacts)
  - Traffic maintained throughout construction
  - Longer service life/decreased maintenance (compared to Alt. 1), resulting in lower long-term costs
- **Disadvantages**
  - Downstream alignment shift
  - One traffic lane for long-term
  - Highest construction cost
  - Impacts outside of existing ROW

ALTERNATIVE 3 COMPLETE REPLACEMENT USING PHASED CONSTRUCTION

ALTERNATIVES Decision Matrix

CONSIDERATION	BRIDGE ALTERNATIVE		
	ALTERNATIVE 1 – COMPREHENSIVE BRIDGE REHABILITATION	ALTERNATIVE 2 – SINGLE-SPAN BRIDGE REPLACEMENT, ON-ALIGNMENT, USING ABC METHODS	ALTERNATIVE 3 – SINGLE-SPAN BRIDGE REPLACEMENT, USING PHASED CONSTRUCTION
Proposed Bridge	• 3-Span (25'-0"-72'-9"-25'-0" C-L Bearing) • 36'-0" Width (2-11' Lanes, 2-5' Shoulders) • On-Line Construction	• Single Span (131'-0" C-L Bearing) • 36'-6" Width (2-11' Lanes, 2-5' Shoulders) • On-Line Construction	• Single Span (125'-0" C-L Bearing) • 36'-6" Width (2-11' Lanes, 2-5' Shoulders) • 7'-6" Downstream Alignment Shift
Proposed Roadway Improvements	• Maintain Current Alignment • Widened Shoulders, Elimination of Narrow Sidewalk	• Maintain Current Alignment • Widened Shoulders, Elimination of Narrow Sidewalk	• 7'-6" Downstream Alignment Shift, Creating Small Reverse Curve • Widened Shoulders, Elimination of Narrow Sidewalk
Traffic Impacts During Construction	• 10-Week Estimated Bridge Closure, Detour Using Other Roads. Phased Construction Not Viable • Extensive Detour and Communications Plan, and Emergency Service Accommodations	• 21-Day Estimated Bridge Closure, Detour Using Other Roads • Incentive/Disincentive to Minimize Bridge Closure Duration • Detour and Communications Plan, and Emergency Service Accommodations	• One-Lane, Signal Controlled Expected to Last 1 Construction Season (7-8 Months)
Constructability	• Bridge Closure Benefits Constructability • Contractor Has Option to Splice Shorter Girders - More Easily Transported and Erected • Scour Protection Measures Difficult to Install – Ideal Installation Time (and Bridge Closure) Coincides with School Schedule	• Bridge Closure Benefits Constructability • Contractor's Operations are Constricted by Short Term Bridge Closure Duration • Long-Span Girders More Difficult to Transport and Erect	• Phased Construction Hinders Constructability (Contractor Must Work Adjacent to Traffic) • Long-Span Girders More Difficult to Transport and Erect
Estimated Construction Cost	$1,760,000	$1,840,000	$2,300,000
Advantages	• Lower Initial Construction Cost (Compared to Alts. 2 & 3) • Existing Alignment Maintained	• Single Span Bridge (No Pier Construction, Fewer Bearings Required, Improved Hydraulics, Less Scour and Seismic Susceptibility, Reduced Environmental Impacts) • Lower Construction Cost (Compared to Alt. 3) • Existing Alignment Maintained • Longer Service Life and Decreased Maintenance (Compared to Alt. 1) – Results in Lower Long-Term Costs	• Single Span Bridge (No Pier Construction, Fewer Bearings Required, Improved Hydraulics, Less Scour and Seismic Susceptibility, Reduced Environmental Impacts) • Traffic Maintained Throughout Construction • Longer Service Life and Decreased Maintenance(Compared to Alt. 1) - Results in Lower Long-Term Costs
Disadvantages	• Existing Substructures Remain (with Piers in River) • Shorter Service life and/or Increased Maintenance of Remaining Components • Long-Term Bridge Closure with Impacts to Travelling Public and Emergency Services – Extensive Detour and Communications Plan for Travelling Public, and Significant Emergency Service Accommodations Necessary	• Inconveniences to Traffic Due to Short-Term Bridge Closure – Detour and Communications Plan Needed • Accommodations for Emergency Services During Closure will Need Consideration	• Downstream Alignment Shift • One Traffic Lane for Long-Term • Highest Construction Cost • Impacts Outside of the Existing Right of way

Recommendation

- **NHDOT and DuBois & King recommend ALTERNATIVE 2, complete replacement using ABC techniques:**
  - New structure with 75+ year service life
  - $80,000 more than ALTERNATIVE 1, but provides 35 more years of service life
  - $460,000 less than ALTERNATIVE 3
  - Short term bridge closure
  - Existing alignment is maintained
  - No private property impacts

Schedule

- Geotechnical borings will be conducted this spring
- Archaeological investigations will be conducted this spring
- Public Hearing (if necessary) Spring 2015
- Design will likely be completed in 2016 or 2017
- Funding for construction is currently slated for 2022